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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/700,722	11/03/2003	Sunder Rathnavelu Raj	NLMI.P041	6031
25670 7590 04/30/2007 WILLIAM L. PARADICE, III 4880 STEVENS CREEK BOULEVARD SUITE 201 SAN JOSE, CA 95129			EXAMINER PYO, MONICA M	
			ART UNIT 2161	PAPER NUMBER
			MAIL DATE 04/30/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/700,722	Applicant(s) RAJ, SUNDER RATHNAVELU	
	Examiner Monica M. Pyo	Art Unit 2161	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 February 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29,31-33 and 45-49 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-29,31-33 and 45-49 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This communication is responsive to the Amendment filed on 2/8/2007. Applicant elected Group I, claims 1-29, 31-33 and 45-49. The Group II, claims 30, 34-44 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b) as being drawn to a non-elected. Claims 1-49 are currently pending.

2. Claims 1-29, 31-33 and 45-49 are rejected.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-4, 6 and 45-46 are rejected under 35 U.S.C. 102(b) as being obvious by Non Patent Literature “A versatile Data String-Search VLSI”, published by IEEE on April 1988, written by Masaki Hirata et al. (hereinafter Hirata).

Regarding claim 1, Hirata discloses a method, comprising:

A). receiving a text string having a plurality of characters, as a search string with characters (Hirata: pg. 329, col. 1, lns. 4-20); **and**

B). performing an unanchored search of a database of a stored patterns matching one or more characters of the text string using a state machine, wherein the state machine comprises a ternary content addressable memory (TCAM) and wherein the performing comprises comparing a state and one of the plurality of characters with

Art Unit: 2161

contents of a state field and a character field, respectively, stored in the TCAM, as the nonanchor mode search, the TCAM and character data stored in the CAM (Hirata: pg. 329, col. 2, lns. 1-12; pg. 330, col. 2, lns. 21-33).

Regarding claim 2, Hirata discloses the method wherein the state is a next state (Hirata: pg. 329, col. 2, lns. 1-16).

Regarding claim 3, Hirata discloses the method further comprising receiving the next state from an associated memory (Hirata: pg. 329, col. 2, lns. 1-16).

Regarding claim 4, Hirata discloses the method wherein the state is an idle state (Hirata: pg. 331, col. 2, lns. 7-17).

Regarding claim 6, Hirata disclose the method wherein performing the unanchored search comprises:

traversing the state machine with the text string, wherein the state machine is traversed with one of the plurality of characters at a time (Hirata: pg. 330, col. 1); and

transitioning a state of the state machine based on a stored next state (Hirata: pg. 331, col. 2, lns.6-25; pg. 332, col. 1, lns. 1-6).

Regarding claim 45, Hirata discloses a string search apparatus, comprising:

A). control circuitry to receive a text string having a plurality of characters, as the control circuits as shown (Hirata: pg. 329, col. 2, lns. 30-pg. 330, col. 1, lns. 19; fig. 2); and
and

B). a pattern and state database including a ternary content addressable memory (TCAM) coupled to an associated memory, wherein the pattern and state database is operable to perform an unanchored search of the plurality of characters with patterns stored in the TCAM and associated memory, as the nonanchor mode search, the TCAM and character data stored in the CAM (Hirata: pg. 329, col. 2, lns. 1-12; pg. 330, col. 2, lns. 21-33).

Regarding claim 46, Hirata discloses the apparatus further comprising a processor coupled to the pattern and state database (Hirata: pg. 329, col: 1, lns. 4-30).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 7-16, 19-21 and 31-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirata in view of U.S. Patent No. 7,134,143 issued to Stellenberg et al. (hereinafter Stellenberg).

Art Unit: 2161

Regarding claim 7, Hirata discloses the method further comprising encoding the next state (Hirata: pg. 330, col. 2, lns. 1-10).

However, Stellenberg discloses: in a lookup table (Stellenberg: col. 4, lns. 7-17; col. 20, lns. 36-49).

It would have been obvious to a person with ordinary skill in the art at the time of invention to modify the teaching of Hirata with the teachings of Stellenberg to utilize the a lookup table in a searching method with the motivation to enhance the logical combination to better determine whether a portion of the data stream matches one of the patterns of bytes (Stellenberg: col. 2, lns. 46-58).

Regarding claim 8, Hirata and Stellenberg disclose the method wherein the plurality of characters comprises valid and invalid characters and wherein encoding comprises encoding the next state in the state machine if a valid character is received in the text string (Hirata: pg. 330, col. 2, lns. 1-10; pg. 331, col. 1, lns. 2-10) and (Stellenberg: col. 5, lns. 35-54; col. 20, lns. 36-49).

Regarding claim 9, Hirata and Stellenberg disclose the method wherein transitioning further comprises transitioning the state machine to a default state if an invalid character is received in the text string (Hirata: pg. 331, col. 2, lns. 7-26-pg. 332, col. 1, lns. 6).

Regarding claim 10, Hirata and Stellenberg disclose the method wherein the transitioning is stopped when an invalid character is received (Hirata: pg. 332, col. 1, lns. 7-21).

Regarding claim 11, Hirata and Stellenberg disclose the method wherein performing the unanchored search comprises searching for an exact match of one of the stored patterns (Hirata: pg. 330, col. 2, lns. 21-33) and (Stellenberg: col. 5, lns. 356-54; col. 9, lns. 36-63).

Regarding claim 12, Hirata and Stellenberg disclose the method wherein performing the unanchored search comprises searching for an inexact match of one of the stored patterns (Hirata: pg. 330, col. 2, lns. 21-33) and (Stellenberg: col. 5, lns. 35-54; col. 9, lns. 36-63).

Regarding claims 13, Hirata and Stellenberg disclose the method wherein the TCAM has a first width and the text string has a second width greater than the first width of the TCAM (Hirata: pg. 329, col. 2, lns. 1-12) and (Stellenberg: col. 21, lns. 56-col. 22, lns. 3).

Regarding claim 14, Hirata and Stellenberg disclose the method wherein each of the plurality of characters has a case, and wherein performing the unanchored search further comprises performing the unanchored search insensitive to the case of one or more of the plurality of characters (Hirata: pg. 330, col. 2, lns. 21-33) and (Stellenberg: col. 9, lns. 36-62; col. 17, lns. 31-39).

Regarding claims 15 and 32, Hirata and Stellenberg disclose the method wherein the text string is encoded in a format having a first plurality of bits, wherein one bit of the first plurality of bits corresponds to the case, wherein the contents of the state field has a second plurality of

Art Unit: 2161

bits and wherein performing the search insensitive to the case comprises (Hirata: pg. 330, col. 2, lns. 34-pg. 331, col. 1, lns. 10) and (Stellenberg: col. 9, lns. 36-62; col. 17, lns. 31-39; col. 20, lns. 36-49; col. 21, lns. 30-55):

masking out the one bit corresponding to the case (Stellenberg: col. 17, lns. 31-39); and
comparing the first plurality of bits with the second plurality of bits (Stellenberg: col. 19, lns. 3-20).

Regarding claims 16 and 33, Hirata and Stellenberg disclose the method wherein performing the search insensitive to the case further comprises transforming the characters of the text string from a first code to a second code, the second code having a bit unused in the comparing (Stellenberg: col. 16, lns. 51-67; col. 17, lns. 31-39).

Regarding claim 19, Hirata and Stellenberg disclose the method wherein performing the unanchored search comprises:

comparing, in parallel, N number of the characters with the content of the state field (Hirata: pg. 330, col. 2, lns. 1-10) and (Stellenberg: col. 4, lns. 7-36).

Regarding claim 20, Hirata and Stellenberg disclose the method wherein the performing further comprises converging all branches of the state machine, for a given stored pattern, to a single next state when a first number of the characters are matched to the contents of a state field to all state transitions of the branches (Hirata: pg. 330, col. 2, lns. 21-33; pg. 331, col. 1, lns. 20-col. 2, lns. 4).

Regarding claim 21, Hirata and Stellenberg disclose the method wherein the single next state is an earlier possible next state for at least one of the branches and wherein the converging comprises

transitioning at least one of the branches to the earlier possible next state (Hirata: pg. 331, col. 1, lns. 20-col. 2, lns. 4).

Regarding claim 31, Hirata discloses a method, comprising:

A). receiving a text string having a plurality of characters, as a search string with characters (Hirata: pg. 329, col. 1, lns. 4-20); **and**

B). performing a search of a database of a stored pattern matching one or more characters of the text string using a state machine, wherein the state machine comprises a ternary content addressable memory (TCAM) and wherein the performing comprises comparing a state and one of the plurality of characters with the contents of a state field and a character field, respectively, stored in the TCAM, as the nonanchor mode search, the TCAM and character data stored in the CAM (Hirata: pg. 329, col. 2, lns. 1-12; pg. 330, col. 2, lns. 21-33).

However, Stellenberg discloses:

B). wherein each of the plurality of characters has a case, and wherein the search is performed insensitive to the case, as a case insensitive data (Stellenberg: col. 17, lns. 31-39).

It would have been obvious to a person with ordinary skill in the art at the time of invention to modify the teaching of Hirata with the teachings of Stellenberg to utilize a case

insensitivity in a searching method with the motivation to enhance the searching method to find matching data stream (Stellenberg: col. 2, lns. 46-58).

7. Claims 5 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirata, as applied to claims 1-4, 6 and 45-46 above, in view of U.S. Patent No. 6,963,942 issued to Igata (hereinafter Igata).

Regarding claims 5 and 49, Hirata discloses the method wherein the TCAM implements (Hirata: pg. 329, col. 1, lns. 1-20)).

However, Igata discloses: an Aho-Corasick algorithm (Igata: col. 4, lns. 41-65).

It would have been obvious to a person with ordinary skill in the art at the time of invention to modify the teaching of Hirata with the teachings of Igata to utilize the Aho-Corasick algorithm searching with the motivation to increase efficiency of text searching result (Igata: col. 4, lns. 41-53).

8. Claims 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirata in view of Stellenberg, as applied to claims 7-16, 19-21 and 31-33 above, and further in view of U.S. Patent No. 6,785,677 issued to Fritchman (hereinafter Fritchman).

Regarding claim 17, Hirata and Stellenberg disclose the method wherein the text string has zero or more wildcard characters, zero or more prefix characters preceding the wildcard

characters and zero or more suffix characters succeeding the wildcard characters, and wherein performing the unanchored search comprises:

searching the database for a first pattern matching (Hirata: pg. 330, col. 1, lns. 20-col. 2, lns. 10); and

searching the database for a second pattern matching (Hirata: pg. 330, col. 1, lns. 20-col. 2, lns. 10).

However, Fritchman discloses:

the prefix characters and the suffix characters (Fritchman: col. 5, lns. 51-53 and 64-67).

It would have been obvious to a person with ordinary skill in the art at the time of invention to modify the teaching of Hirata and the teachings of Stellenberg with the teachings of Fritchman to utilize the prefix and suffix characters in a data stream comparison with the motivation to improve performance of executing pattern matching queries (Fritchman: col. 1, lns. 8-29).

Regarding claim 18, Hirata and Stellenberg and Fritchman disclose the method wherein performing the unanchored search further comprises creating a count that equals a number of the suffix characters plus a number of the wildcard characters (Hirata: pg. 330, col. 2, lns. 21-33) and (Stellenberg: col. 2, lns. 41-45; col. 9, lns. 36-62) and (Fritchman: col. 5, lns. 51-53 and 64-67).

9. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hirata in view of Stellenberg, as applied to claims 7-16, 19-21 and 31-33 above, and further in view of Non Patent

Art Unit: 2161

Literature "Fast Routing Table Lookup Using CAMs", published by IEEE on 1993, written by Anthony J. McAuley et al (hereinafter McAuley).

Regarding claim 22, Hirata and Stellenberg disclose the method further comprising:
storing the characters storage element having a plurality of positions (Hirata: pg. 329, col. 1, lns. 4-20) and (Stellenberg: col. 4, lns. 7-17);
positioning a read pointer at a first position (Stellenberg: col. 6, lns. 18-46); and
adjusting the read pointer to a second position by an amount equal to N minus 1 (Stellenberg: col. 6, lns. 18-46).

However, McAuley discloses:

in a first-in-first-out (FIFO) (McAuley: pg. 1388, col. 1, [6.1]).

It would have been obvious to a person with ordinary skill in the art at the time of invention to modify the teaching of Hirata and the teaching of Stellenberg with the teachings of McAuley to utilize the FIFM method in the searching system with the motivation to increase efficiency of text searching result (McAuley: pg. 1382, col. 1, [Introduction]).

10. Claims 23-24 and 28-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirata, as applied to claims 1-4, 6 and 45-46 above, in view of Fritchman..

Regarding claim 23, Hirata disclose a method, comprising:

A). **receiving a text string**, as a search string with characters (Hirata: pg. 329, col. 1, lns. 4-20);

B). performing a first search on a ternary content addressable memory (TCAM) for, as the TCAM and character data stored in the CAM (Hirata: pg. 329, col. 2, lns. 1-12; pg. 330, col. 2, lns. 21-33).

and

C). performing a second search of the TCAM for, as the TCAM and character data stored in the CAM (Hirata: pg. 329, col. 2, lns. 1-12; pg. 330, col. 1, lns. 20-col. 2, lns. 10).

However, Fritchman discloses:

A). having a plurality of characters including a first number of prefix characters, a second number of wildcard characters succeeding the prefix characters, and a third number of suffix characters succeeding the wildcard characters, as a prefix, a wildcard and a suffix character in a string (Fritchman: col. 7, lns. 65-col. 8, lns. 37).

B). a first stored pattern matching the prefix characters, as a prefix character in a string (Fritchman: col. 8, lns. 38-51).

C). a second stored pattern matching the suffix characters, as a suffix character in a string (Fritchman: col. 8, lns. 25-37).

It would have been obvious to a person with ordinary skill in the art at the time of invention to modify the teaching of Hirata with the teachings of Fritchman to utilize the prefix and suffix characters in a data stream comparison with the motivation to improve performance of executing pattern matching queries (Fritchman: col. 1, lns. 8-29).

Regarding claim 24, Hirata and Fritchman disclose the method further comprising creating a count that equals a number of the suffix characters plus a number of the wildcard

Art Unit: 2161

characters (Hirata: pg. 330, col. 2, lns. 34-pg. 331, col. 1, lns. 10) and (Fritchman: col. 8, lns. 30-67).

Regarding claim 28, Hirata and Fritchman disclose the method further comprising:

returning a match result when the first stored pattern matches the prefix (Fritchman: col. 3, lns. 35-63; col. 5, lns. 21-22)

characters, the second stored pattern matches the suffix characters, and second number of wildcard characters is fixed (Fritchman: col. 3, lns. 35-63).

Regarding claim 29, Hirata and Fritchman disclose the method further comprising:

storing a count value that equals a number of the suffix characters plus the fixed second number of the wildcard characters (Hirata: pg. 330, col. 2, lns. 34-pg. 331, col. 1, lns. 10) and (Fritchman: col. 3, lns. 35-63); and

maintaining a count of incoming characters of the text string after receiving the prefix characters (Fritchman: col. 5, lns. 21-22; col. 8, lns. 30-67); and

returning the match result when the maintained count is equal to the stored count value (Fritchman: col. 8, lns. 30-67).

11. Claims 25-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirata in view of Fritchman, as applied to claims 23-24 and 28-29 above, and further in view of Stellenberg.

Regarding claim 25, Hirata and Fritchman do not explicitly disclose the method wherein each of the plurality of characters has a case, and wherein the first and second searches are insensitive to the case.

However, Stellenberg discloses: the method wherein each of the plurality of characters has a case, and wherein the first and second searches are insensitive to the case (Stellenberg: col. 17, lns. 31-39).

It would have been obvious to a person with ordinary skill in the art at the time of invention to modify the teaching of Hirata and the teaching of Fritchman with the teachings of Stellenberg to utilize the case insensitivity in a searching method with the motivation to enhance the searching method to find matching data stream (Stellenberg: col. 2, lns. 46-58).

Regarding claims 26, Hirata and Fritchman and Stellenberg disclose the method wherein the TCAM has a first width and the text string has a second width greater than the first width (Hirata: pg. 329, col. 1, lns. 4-20) and (Stellenberg: col. 21, lns. 56-col. 22, lns. 3).

Regarding claim 27, Hirata and Fritchman and Stellenberg disclose the method further comprising:

returning a match result when the first stored pattern matches the prefix characters, the second stored pattern matches the suffix characters, and second number of wildcard characters is variable (Fritchman: col. 3, lns. 35-63; col. 8, lns. 30-67).

12. Claim 47 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hirata, as applied to claims 1-4, 6 and 45-46 above, and in view of McAuley.

Regarding claim 47, Hirata discloses the apparatus wherein the control circuitry comprises:

a register coupled to storage element and the TCAM (Hirata: pg. 330, col. 2, lns. 34-pg. 331, col. 1, lns. 10) .

However, McAuley discloses:

the FIFO; a first-in-first-out (FIFO) storage element (McAuley: pg. 1388, col. 1, [6.1]);
and

It would have been obvious to a person with ordinary skill in the art at the time of invention to modify the teaching of Hirata with the teachings of McAuley to utilize the FIFM method in the searching system with the motivation to increase efficiency of text searching result (McAuley: pg. 1382, col. 1, [Introduction]).

13. Claim 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hirata in view of McAuley, as applied to claim 47 above, and further in view of U.S. Patent No. 5,712,971 issued to Stanfill et al. (hereinafter Stanfill).

Regarding claim 48, Hirata and McAuley disclose the apparatus wherein the control circuitry further comprises a circuit coupled to the FIFO storage element (Hirata: pg. 329, col. 2, lns. 30-pg. 330, col. 1, lns. 19; fig. 2) and (McAuley: pg. 1388, col. 1, [6.1]).

Art Unit: 2161

However, Stanfill discloses: a rollback (Stanfill: col. 10, lns. 55-67).

It would have been obvious to a person with ordinary skill in the art at the time of invention to modify the teaching of Hirata and the teaching of McAuley with the teachings of Stanfill to utilize the rollback command in a searching method with the motivation to be able to undone the last operation (Stanfill: col. 4, lns. 10-26).

Response to Arguments

14. Applicant's arguments filed on 2/1/2007, with respect to the **U.S. Patent Application Publication No. 2006/0259508 by Sikdar et al. in view of various other cited references** have been fully considered and are persuasive. Therefore, the prior rejection made 35 U.S.C. 103 is withdrawn.

Conclusion

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica M. Pyo whose telephone number is 571-272-8192. The examiner can normally be reached on Monday & Thursday 8:00 AM - 5:00 PM.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Apu Mofiz can be reached on 571-272-4080. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2161

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Monica M Pyo
Examiner
Art Unit 2161

mp
4/19/2007



APU MOFIZ
SUPERVISORY PATENT EXAMINER